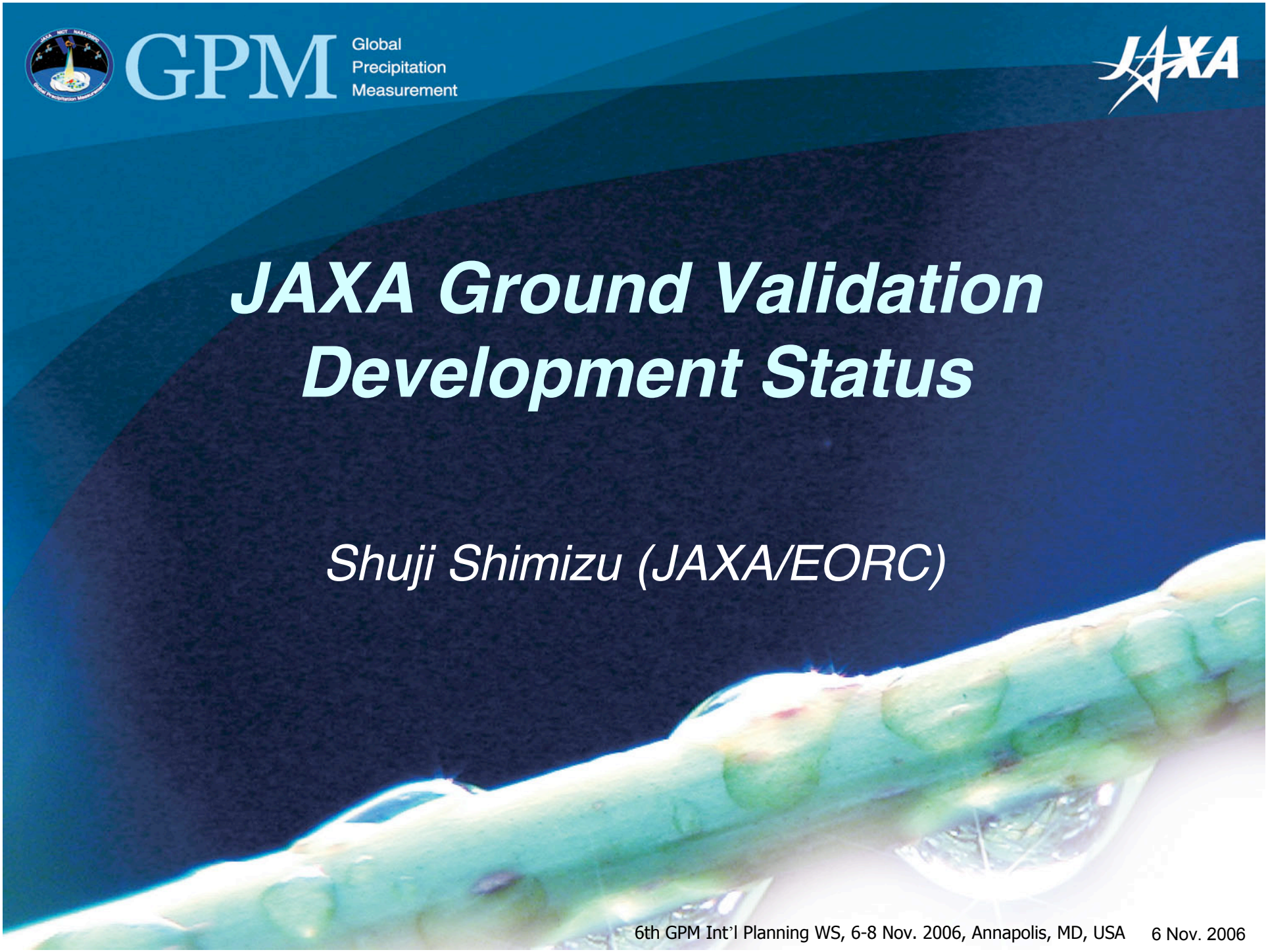


JAXA Ground Validation Development Status

Shuji Shimizu (JAXA/EORC)

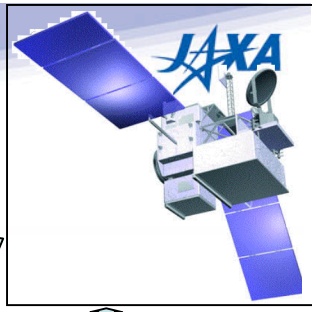
Japanese GV principles

We have two strategies for GV activities.

1. *Algorithm specific validation for each rain retrieval algorithm of DPR before GPM-core satellite launch*
   - *Simultaneous development of the precipitation retrieval algorithms and their validation methods.*
   - *Detection of parameters of synthetic nature are most important and difficult challenge.*

2. *Comparison with ground-based datasets after GPM-core satellite launch*
   - *Calibration and instantaneous comparison with well-calibrated instruments just after launch*
   - *Statistical comparison with long-time observation data and operational data, especially for precipitation map data*

Paradigm for algorithm validation with DPR



True values in Nature

Reflectivity (Ze), Rain Rate (R)

Hydrometeor (Rain, Snow, Graupel, etc.)
Vertical velocity (v(D))

Rain (snow) water content (PWC(h))
Density (ρ(h))
Drop Size Disribution (N(D,h)), etc

Synthesized Nature

DSD(h)
v(D)
Particle types

Reproduce physical parameters for forward calculation from ground-based observation using GV algorithms

Water vapor
Cloud water content (Liquid, Solid)
Oxygen
Aerosol
Sea Surface Temperature
Noise, etc

Compare

Compare

Remote Sensing

GV data

Zm(h), v(D), R, N(D), Particle type, PWC, etc

GV algorithm

Rain Rate (R(h))

In-situ measurement

Compare

GV algorithm

Retrival Numerical models

Compare

Assumption

Particle types
DSD, v(D)
Non-Uniformity, etc.

Compare

forward calculation

Z_{m14}
Z_{m35}

Retrieval Algorithm

Rain rate (R(h))

(Iguchi, 2004)

Progress of GV study in Japan

Activities in Japan related to GPM GV

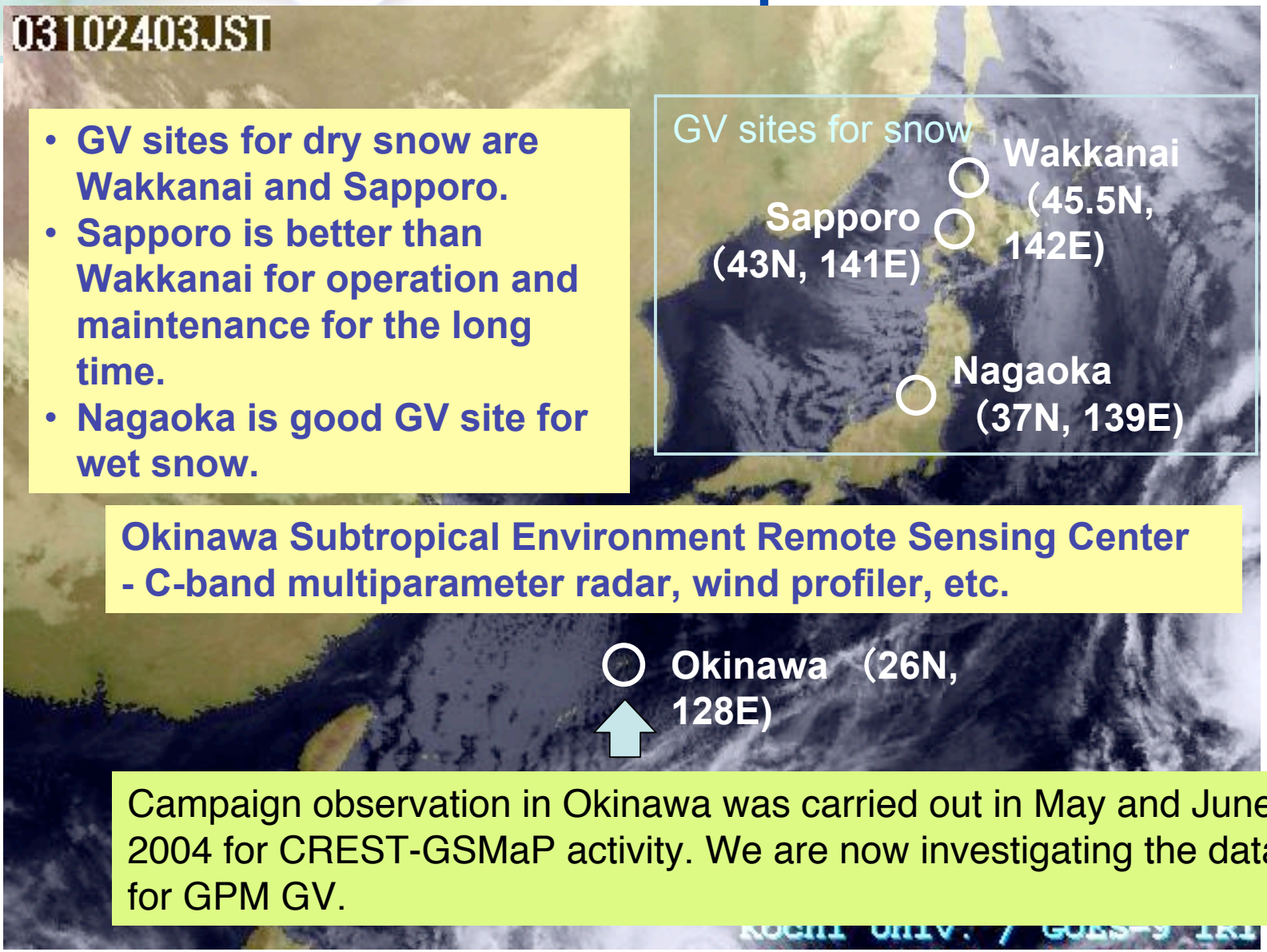
1. *Domestic GV meetings*

2. *DPR algorithm studies*

1. Domestic GV meetings

- *We had discussion on GV planning and the combined algorithm development.*
  - *We discussed the schedule of GV activities in GV planning meeting in Japan. (June 6, 2006)*
    - *Campaign observations for GV and algorithm development will be carried out 3 years before the GPM-core satellite launch.*
  - *We also discussed the contents of GV observation for liquid and solid precipitation.*
    - *Observation of microphysical parameters are essential.*
      - *Dual-polarization radars, dual-frequency radars, Wind profilers, Micro rain radars, 2-D video disdrometers, Rain gauges, Snow particle observation systems, etc…*
  - *Importance of Microphysics - GV - microphysical modelling linkage*
  - *Evaluation of candidates for GV supersites, especially for possibility of snow sites*

Candidates for GPM GV Supersite



- GV sites for dry snow are Wakkanai and Sapporo.
- Sapporo is better than Wakkanai for operation and maintenance for the long time.
- Nagaoka is good GV site for wet snow.

GV sites for snow

Wakkanai (45.5N, 142E)

Sapporo (43N, 141E)

Nagaoka (37N, 139E)

Okinawa Subtropical Environment Remote Sensing Center
- C-band multiparameter radar, wind profiler, etc.

Okinawa (26N, 128E)

Campaign observation in Okinawa was carried out in May and June 2004 for CREST-GSMaP activity. We are now investigating the data for GPM GV.

2. DPR algorithm studies

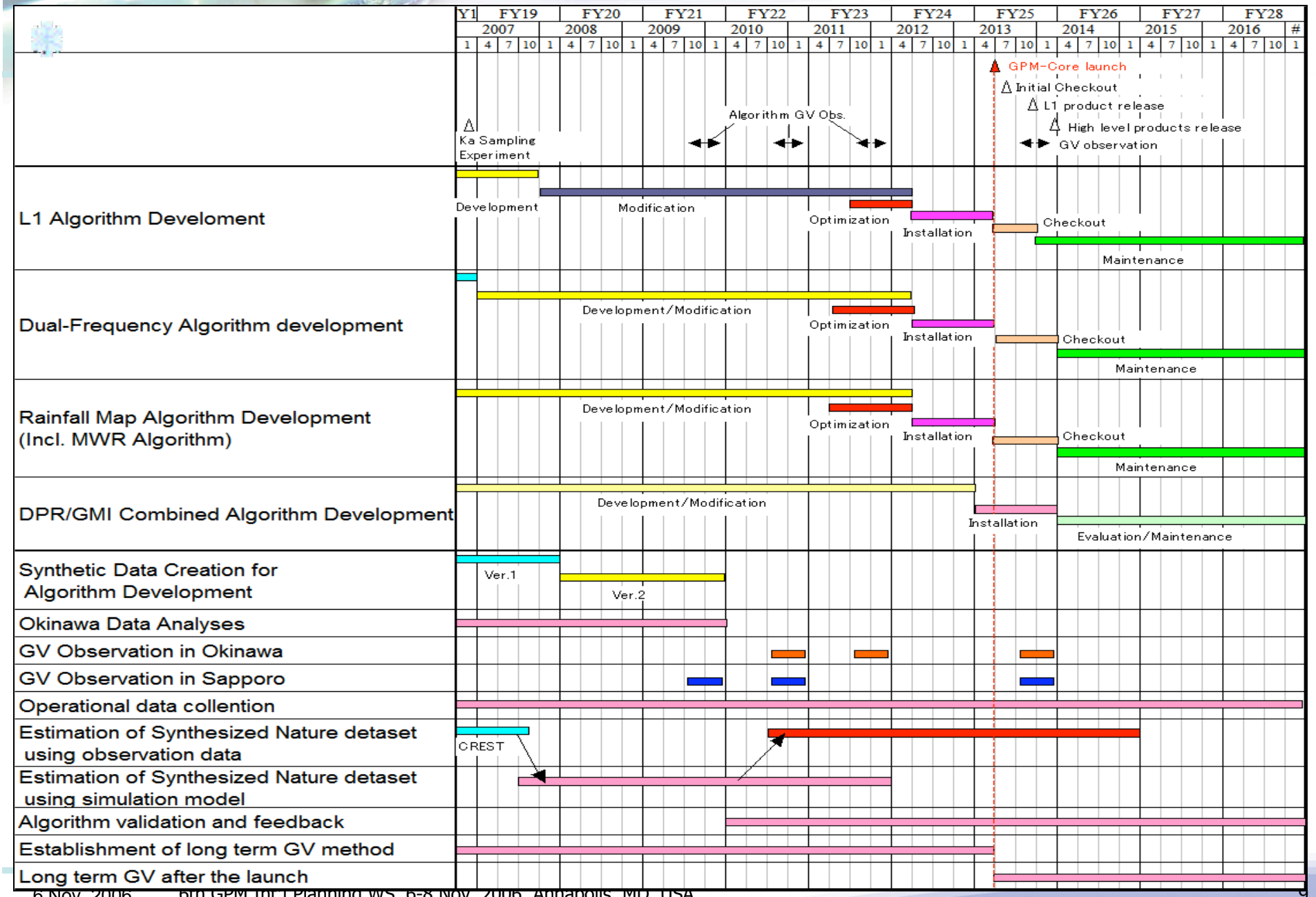
- *Investigation of the algorithm development and connection with GV observation activities.*
- *Level 1 algorithm of DPR is investigated by JAXA.*
  - *We are now creating simulation Level 0 data for the science telemetry format of DPR.*
  - *We plan to carry out the experiment for KaPR geometric simulation data using TRMM PR in next January or February.*
- *Higher level algorithms are investigated by algorithm developers in GPM science team.*
- *DPR/GMI combined algorithm are investigated by the algorithm development team.*
  - *7 meetings have been held since the last workshop.*

DPR/GMI combined algorithm development

- *Precipitation profiles from DPR will be adjusted using GMI information, especially for scattering effect of high frequency channel.*
- *Understanding of microphysical processes is essential for evaluation of scattering properties.*
- *Algorithms development incorporated with Microphysics*

GV algorithm

Schedule for GV activities



Summary and Future

- *Two types of GV activity*
  - *Prior observation of launch for algorithm validation*
    - *Importance of Microphysics - GV - microphysical modelling linkage*
    - *Campaign observation for microphysics in 2010*
    - *Synthesized data for algorithm development using Okinawa data and GV observation data before the campaign*
  - *Post observation of launch for product validation*

- *DPR algorithm development*
  - *Level 1 algorithm*
    - *Simulated products will be made in this fiscal year.*
  - *Higher level algorithms*
    - *DPR/GMI combined algorithm is continuously examined.*
  - *Simultaneous development of the precipitation retrieval algorithms and their validation methods*

- *We are reconstructing the schedule and budget for GV activities.*

Backup

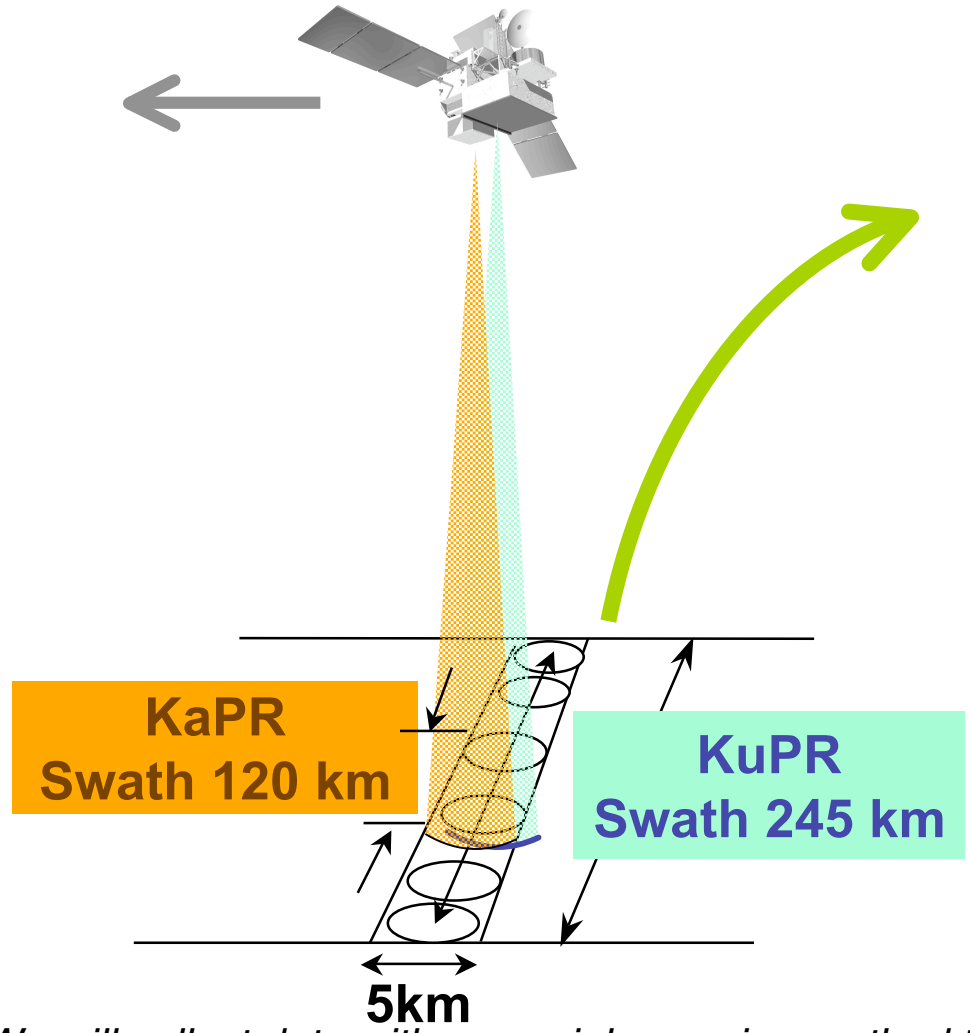
Key issues for success of GV activities

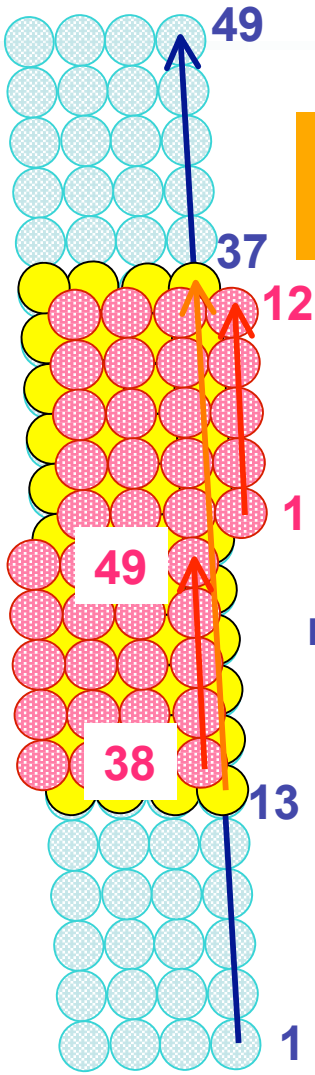
- How do we synthesize physical parameters from GV data?
  - We need to collect appropriate observation data.
  - We need to establish GV algorithms for synthesizing physical parameters.
  - We need to make Z_m data by forward calculation.
- Which parameters do we need for assumption in retrieval algorithms?

We have to simultaneously develop the precipitation retrieval algorithms and their validation methods.

PR experiments for GPM/DPR design

KaPR geometric data simulation





KaPR
25 beams + 24 beams

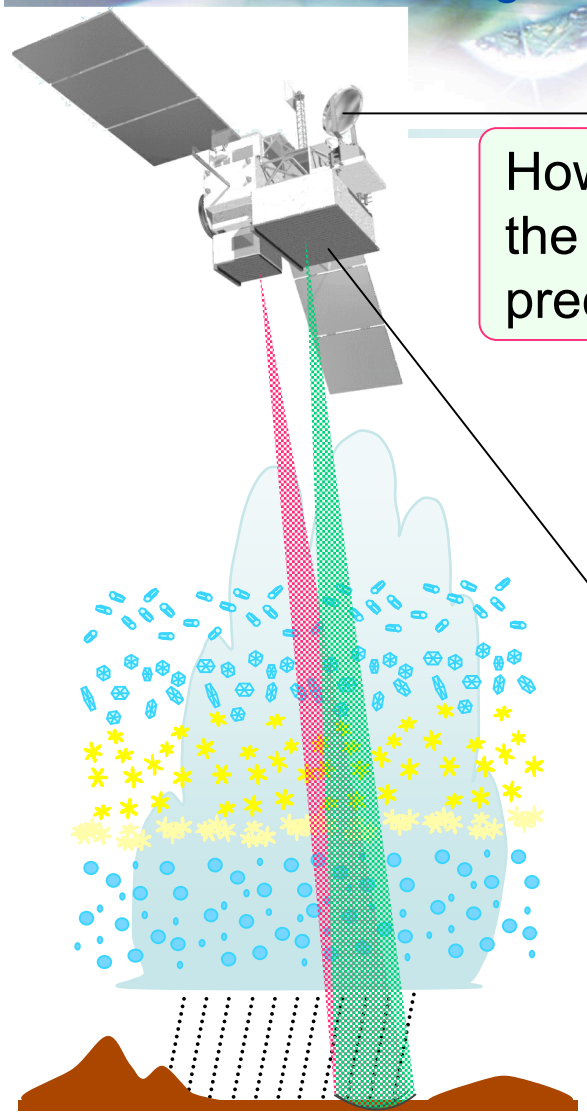
High sensitivity and spatial oversampling

Beam matching for dual-frequency observation

KuPR:49 beams

We will collect data with a special scanning method that simulates the planned scanning method of KaPR in which the adjacent footprints overlap approximately by halves

The combined algorithm flow



Correction using wind speed on sea surface

Objective analyses

Tb_{obs}

How do we estimate the scatter of solid precipitation particles?

Parameters of microphysics Water vapor

Feedback

Compare

DSD
v(h)
Particle detection
ρ

Dual-frequency algorithm

D_0
N_0

R_{DPR}

Tb_{sim}

H

Z_{m35}

Z_{m14}

Input

RTM Cal.

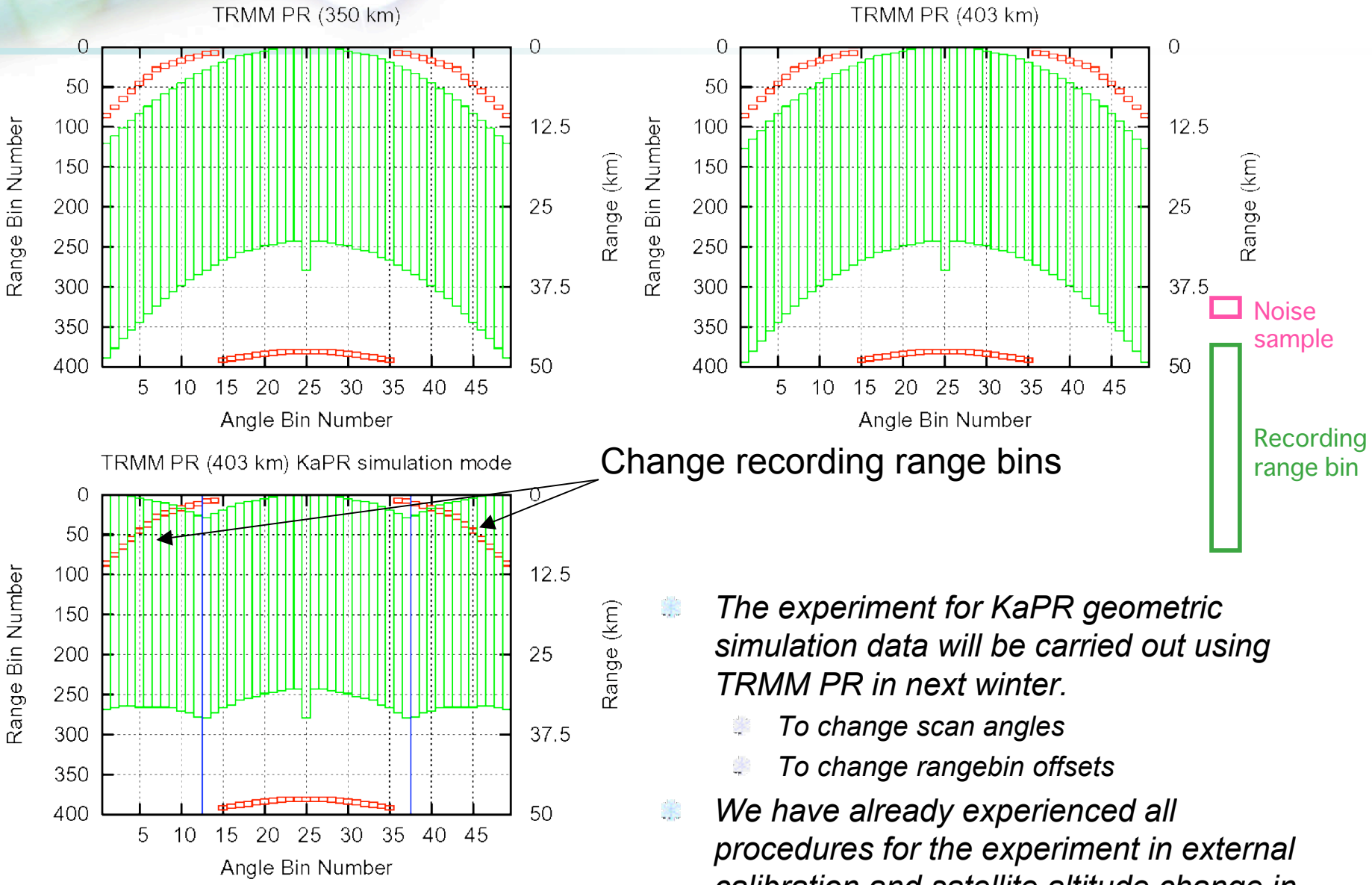
Physical model

σ^0

Z

Retrieval of cloud physical parameters from GV observation (ex. Okinawa, Sapporo)

Range bin offset for the PR experiment



- *The experiment for KaPR geometric simulation data will be carried out using TRMM PR in next winter.*
  - *To change scan angles*
  - *To change rangebin offsets*
- *We have already experienced all procedures for the experiment in external calibration and satellite altitude change in 2001.*